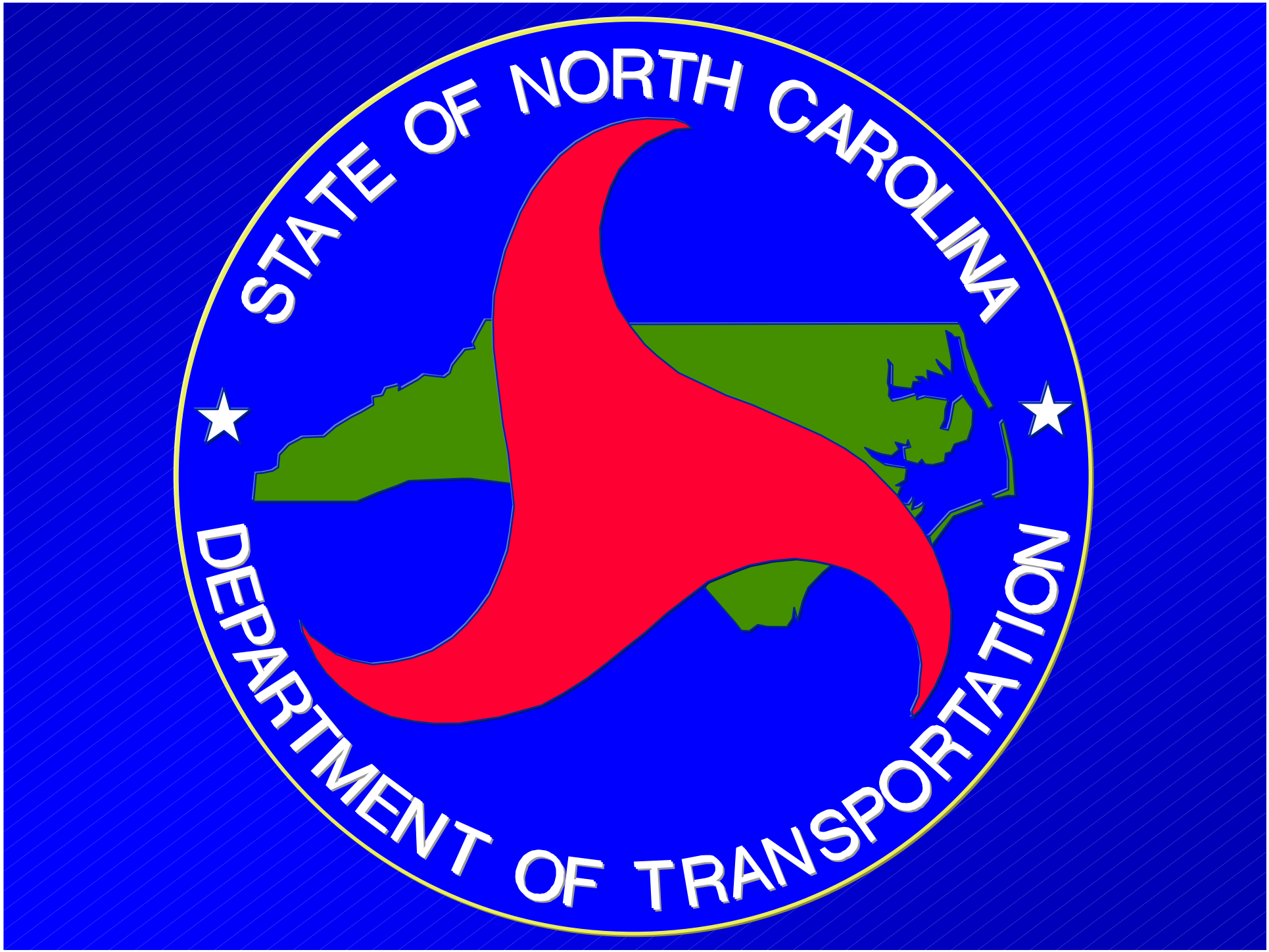

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MAKING WORK ZONES WORK BETTER Through Innovations in Technologies, Practices, and Products

SMART Work Zones: Technology for work zone management

Steve Kite, PE
Traffic Control
Project Engineer

North Carolina
Department of Transportation

Work Zone
STAY ALERT

FHWA Workzone Facts

Between 1980 and 1998, vehicle travel was up 73%, while the number of road miles increased by only 1%.

13% of the National Highway System is under construction at any given time.

24% of non-recurring congestion is due to work zones.

Motorists are less tolerant with delays especially those associated with workzones.

Resulting in…..

FHWA Goals

Reduce work zone delay by ensuring all states are engaged in aggressively anticipating and mitigating congestion caused by highway work zones.

Actions for use by State Agencies:

1) Develop methods for measuring and monitoring delays in work zones

2) Use available technology to reduce congestion in workzones.

3) Provide automated, real time travel information in advance of the work zones.

What is North Carolina doing?!#

NCDOT is proactively deploying the technology to mitigate congestion in highway work zones

hmm…..SMART Work Zones

What is a SMARTZONE and how do they work?

“SMARTZONE” or ‘SMART Work Zone’ is the term commonly used to describe the technology and equipment that monitors and manages traffic congestion due to work zones.

Typically these systems incorporate roadside speed and volume sensors to detect work zone congestion.

This information is then transmitted to an on-site computer via radio, cellular or satellite communication for processing.

The corresponding delay information is displayed on portable changeable message signs in an automated, real-time manner.

In some cases, once the delay exceeds a threshold, alternate route messages may be displayed.

OUR SMARTZONE GOALS

Use this Technology to:

Eliminate Fatalities due to excessive traffic queuing in highway work zones.

Virtually eliminate “rear end” crashes due to queues.

Mitigate queues to 2 miles or less.

Provide real time delay information in advance of work areas.

Utilize alternate routes where available to reduce volume thru work area.

Earn trust with motorists to reestablish compliance with work zone information. We want to exceed our customers’ expectations !!

How much does it cost?

Depends on how much equipment is necessary to provide the required monitoring.

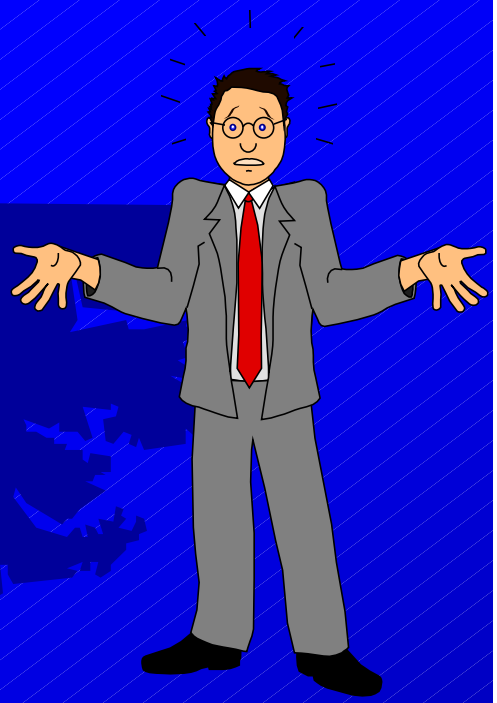
Depends on length of work zone and if both directions need simultaneous monitoring

Depends on the type of communication technology that is required (i.e. radio versus cellular and satellite)

Depends on the complexity of the individual vendors system (i.e. software cost, communication costs, etc.)

What are the measurable results?

- Reduction of Congestion associated with lane closures
- Reduction/elimination of “rear end” crashes due to excessive queuing
- Reduction/elimination of Fatal Crashes due to excessive queuing
- Increased Productivity for the Contractor



Intangible Factors

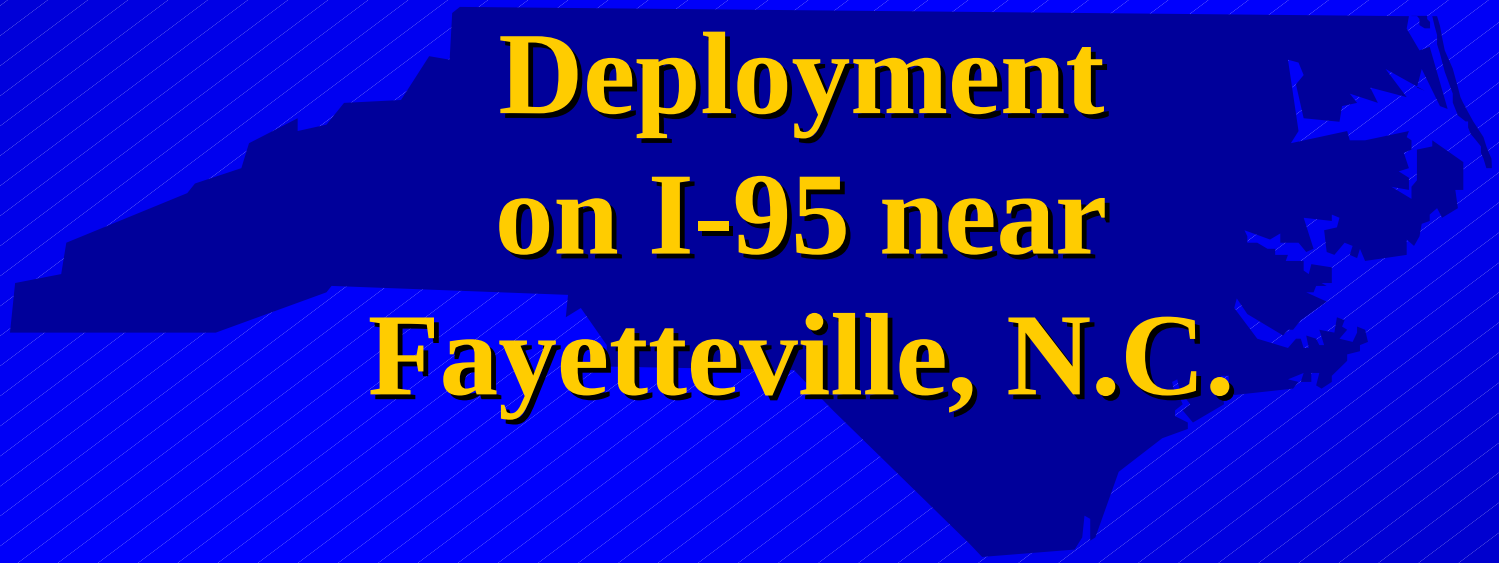
Believable, Real Time information resulting in better compliance with work zone information.

Better relations with the media industry which in turn is used as the key link to provide information to the public.

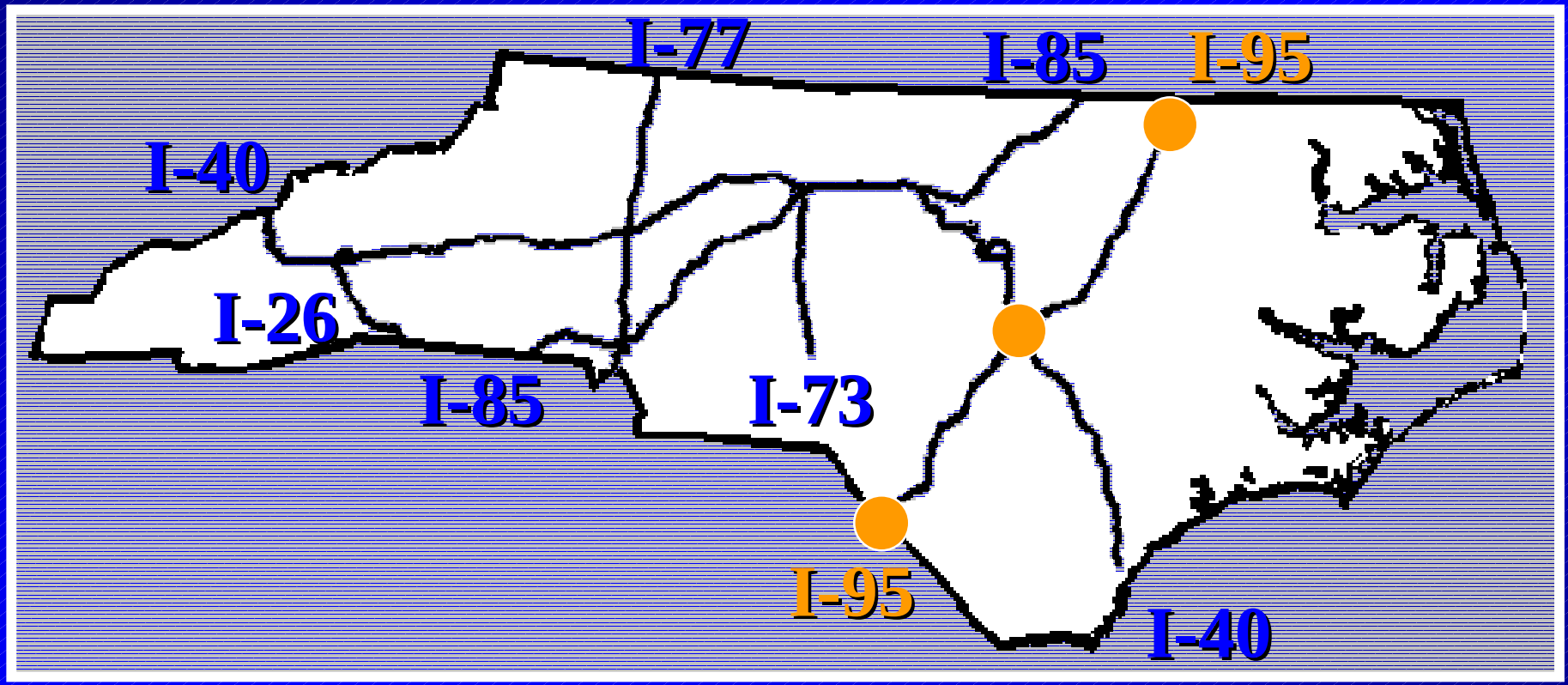
Improved Communication with the Motoring Public resulting in improved Department Image

Regaining the trust from the motoring public….providing them the information they want and need and more importantly…<u>when</u> they need it!

SMARTZONE Deployment on I-95 near Fayetteville, N.C.



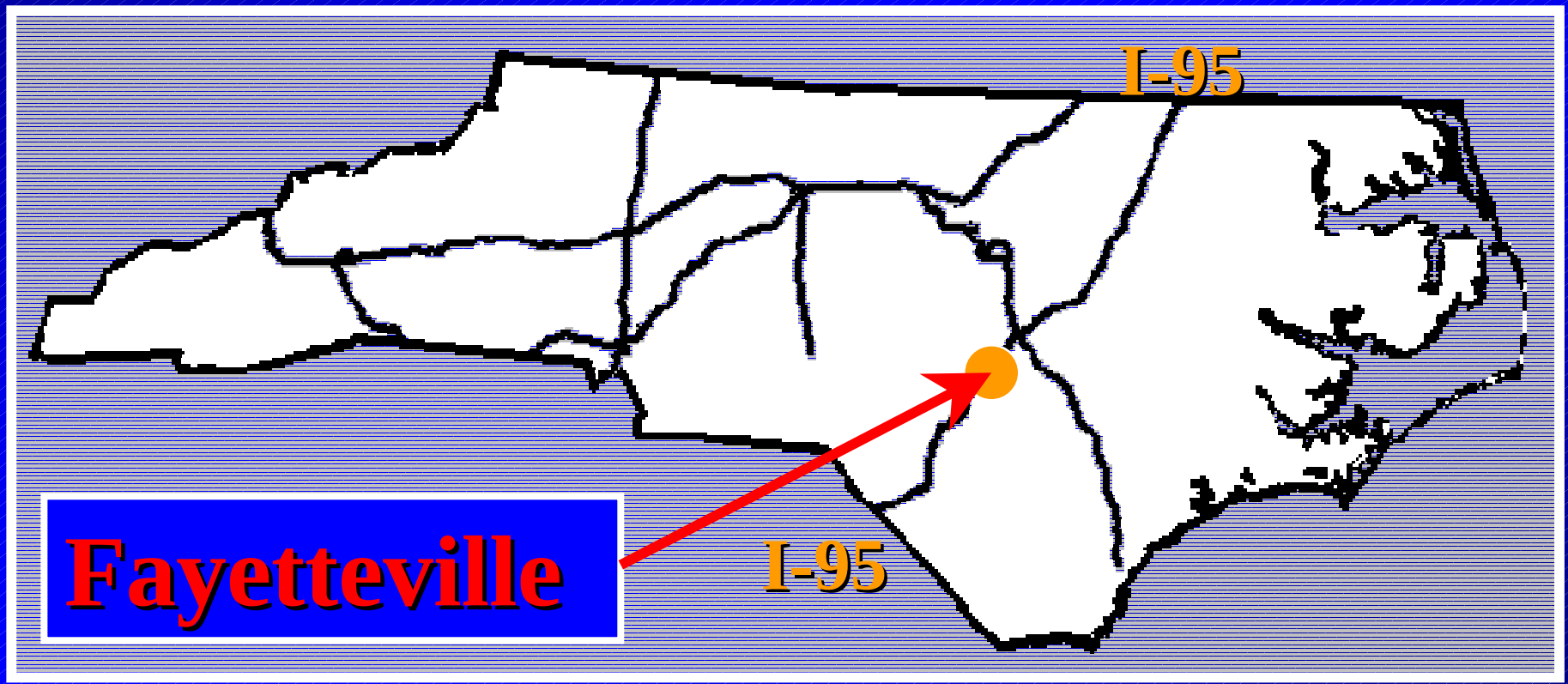
Interstate Network in North Carolina



Over 80,000 miles of state maintained roads- 2nd largest in the Nation

Over 1000 miles of interstate highway

North Carolina's first SMARTZONE Deployment on I-95 Near Fayetteville



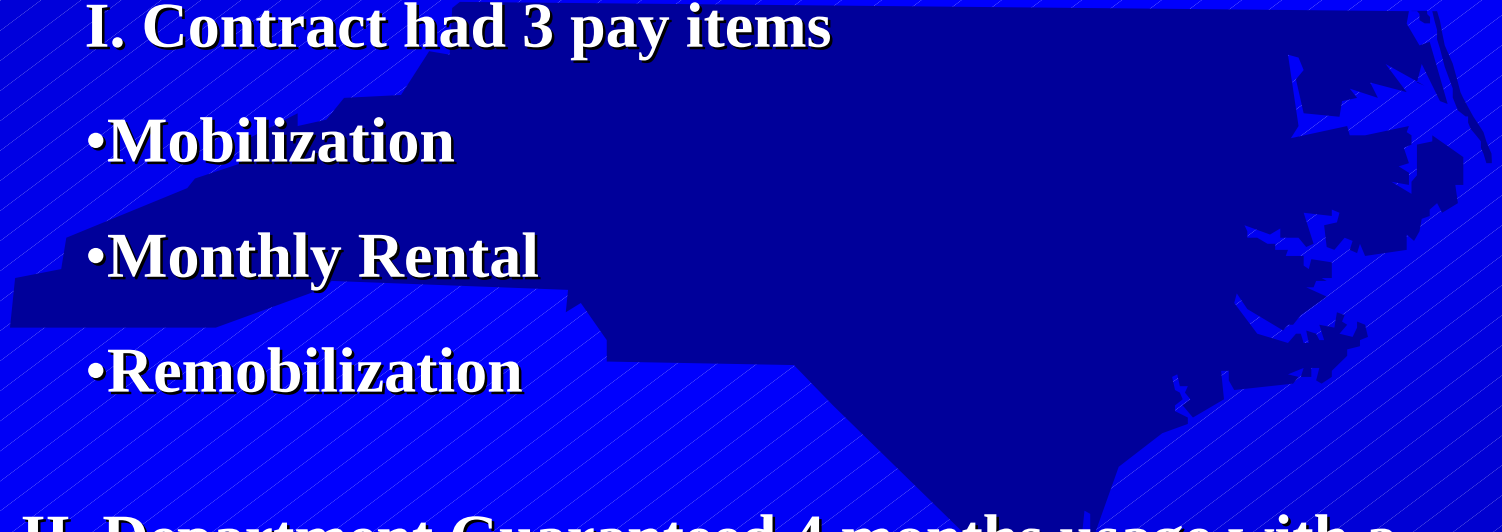
SMARTZONE EQUIPMENT

I-95 SMARTZONE Deployment

System Requirements

- 6 speed sensors
- 8 Changeable Message Signs (2 used on Alternate Routes)
- 6 cameras (w/ Pan/Tilt/Zoom)
- 1 Command Center
- 1 Laptop Computer
- Dedicated Project Website

I-95 SMARTZONE
Contract Information



I. Contract had 3 pay items

- **Mobilization**
- **Monthly Rental**
- **Remobilization**

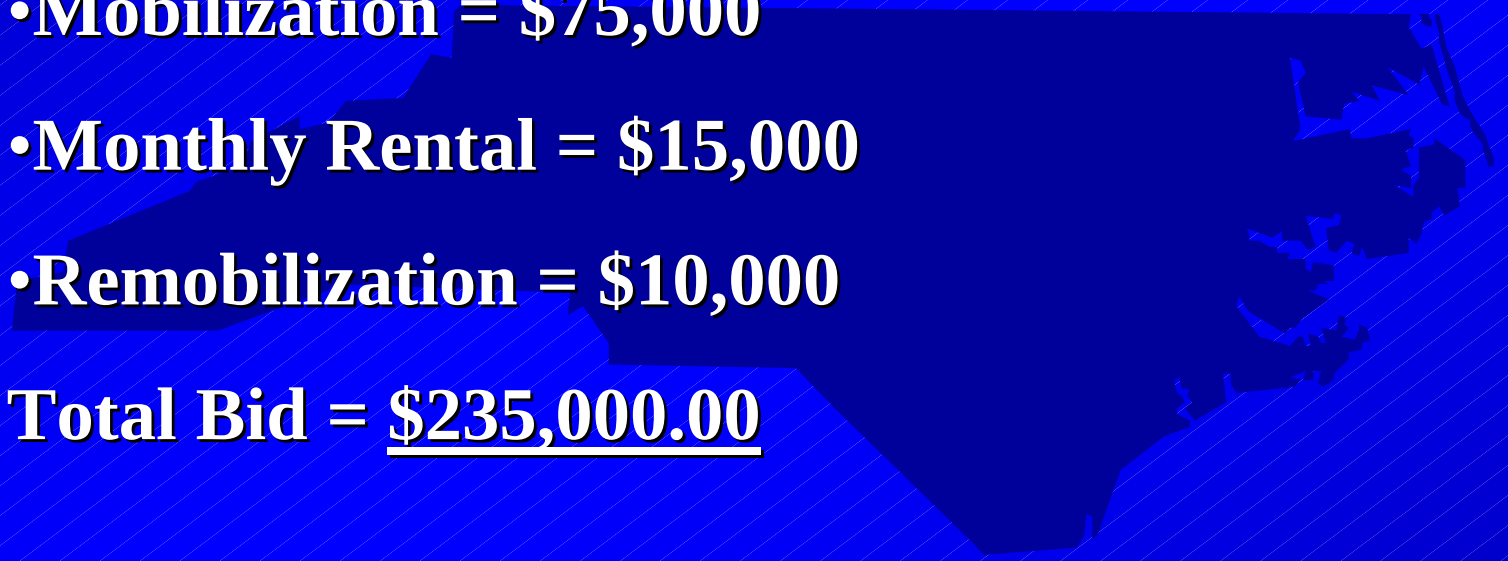
II. Department Guaranteed 4 months usage with a maximum 10 month duration

I-95 SMARTZONE COSTS

Successful Bidder was the Scientex Corporation

- **Mobilization = $75,000**
- **Monthly Rental = $15,000**
- **Remobilization = $10,000**

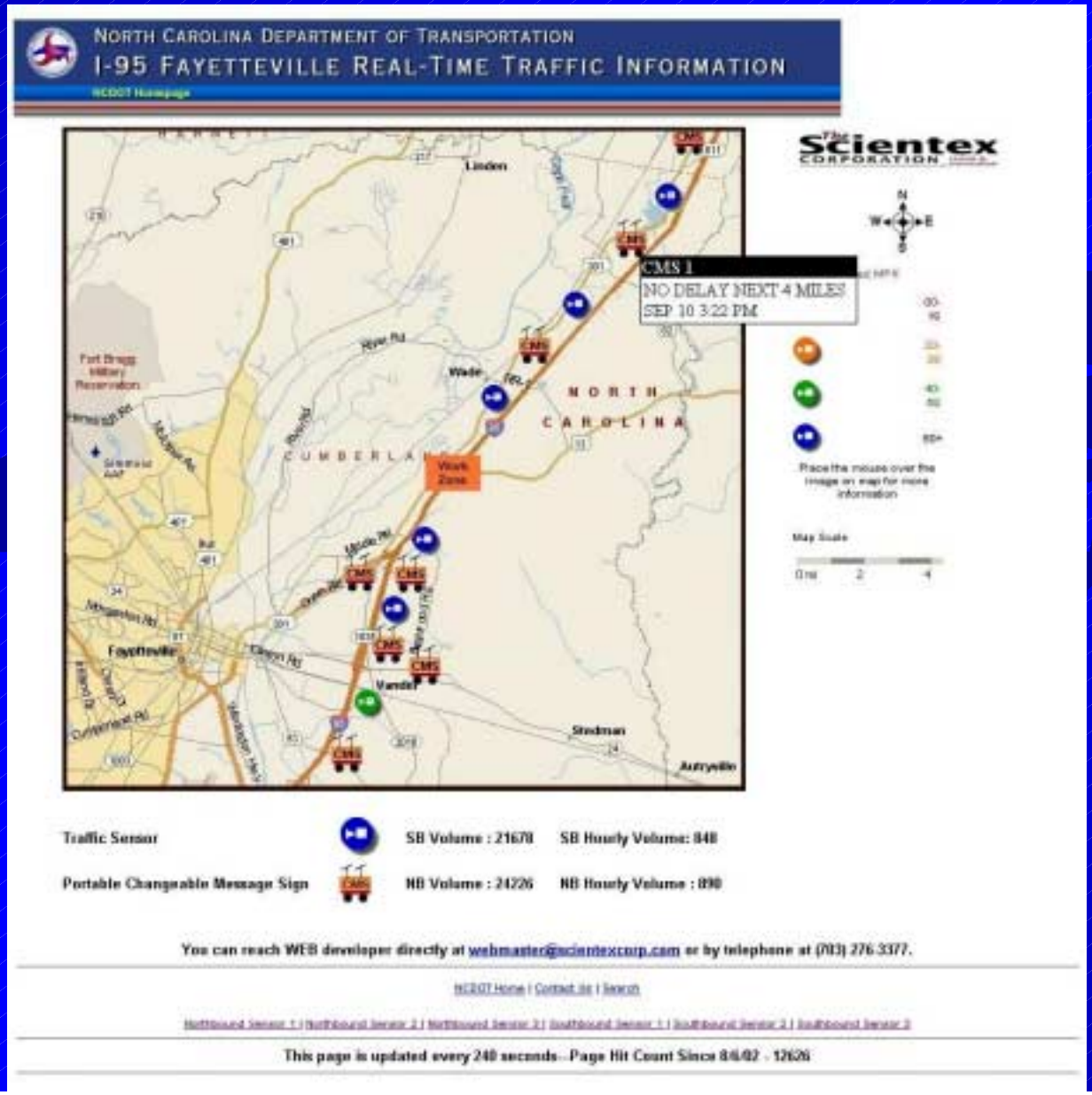
Total Bid = $235,000.00



Current expenditure = $135,000.00. Project is currently demobilized due to lane closure phase of project is completed

Project Website

www.i95fayetteville.com



Devices

Camera trailer with Satellite communication

Note: Cameras not needed for system operation. Department Observation Purposes Only

SMARTZONE DEVICES

Solar Powered CMS with RTMS and Speed Sensor

Camera

Speed Sensor

SMARTZONE- Remote Traffic Microwave Sensor (RTMS) Sensor

Traffic Volume Collector

COMMAND CENTER

SMARTZONE COMMUNICATIONS

REAL TIME INFORMATION

REAL TIME INFORMATION

REAL TIME INFORMATION

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REAL TIME INFORMATION

I-95 SMARTZONE Results

Traffic queues were reduced on average to 2 miles or less. Before deployment, queues were exceeding 5 miles

No recorded “rear end” crashes and no Fatalities

Delay information was accurate

Some utilization of alternate routes

A lot of positive response from media and motorists

News and Observer Article

July 2, 2002

Traffic warnings make I-95 cool

By VICKI HYMAN

Until now, I've never found cause to string together the words "North Carolina Department of Transportation" with "cool."

The state has installed its first "smart work zone" on Interstate 95 outside Fayetteville, equipping the highway with sensors to detect speed, calculate traffic conditions and relay real time information to electronic message boards and a Web site.

I'm not talking messages like "Delays Ahead" or "Expect Congestion" that you might see on I-40 around rush hour. With all due respect to the technicians who spend hours monitoring traffic conditions via live feeds from cameras posted along the highway, let me just say, "No duh."

The messages posted on I-95 can tell drivers, to the minute, how long a delay to expect. Once the delay reaches 10 minutes, the electronic message boards offer alternate route information. The state has placed the message boards far enough ahead of the backups to give drivers a way out before they actually hit the traffic.

On the Web site, http://www.I95fayetteville.com, you can even view how fast traffic is moving through the work zone.

I-95 SMARTZONE Problems

Downtime due to equipment malfunction primarily caused by lightening strikes

Under-powered camera/sensor equipment

Communication problems with cameras. Had to utilize satellite communications

Availability of speed, volume and video information

Future Changes

Utilize “on-site” technician

Improve Departments access to speed, volume and video information via the website

Utilize pay reduction for system downtime

Have system notify (via Page, email, cell phone) appropriate personnel if a malfunctions occurs

Improve messages on CMS’s to enhance ridership on the Alternate Routes

So far….what we think we know

1) SMARTZONES "AIN'T" a substitute for sound traffic engineering

2) Need to understand what you want the system to do before you let a contract

Guidelines for application

SMARTZONES work well on rural interstates with AADT's up to 55,000 with available alternate routes. Interstate Rehabilitation Projects are ideal!….primarily due to their high frequency of lane closure

(continued next page)

Guidelines Continued

SMARTZONES may have applications on roadways with higher AADT's (55,000 to 65,000) where we traditionally restrict lane closures to nightly activity.

You may look at using the SMARTZONE technology to mitigate the congestion during non-peak hour flow. Use traditional lane closure restrictions for peak hour.

SMARTZONES may have limited applications on high volume roadways (above 65,000) with few reasonable alternate routes. However, if reoccurring congestion is a problem, the technology could provide real time, delay information in lieu of congestion mitigation.

SMARTZONES can also be used for more traditional problems such as speeding and site condition problems such as hydroplaning and/or severe alignment concerns.

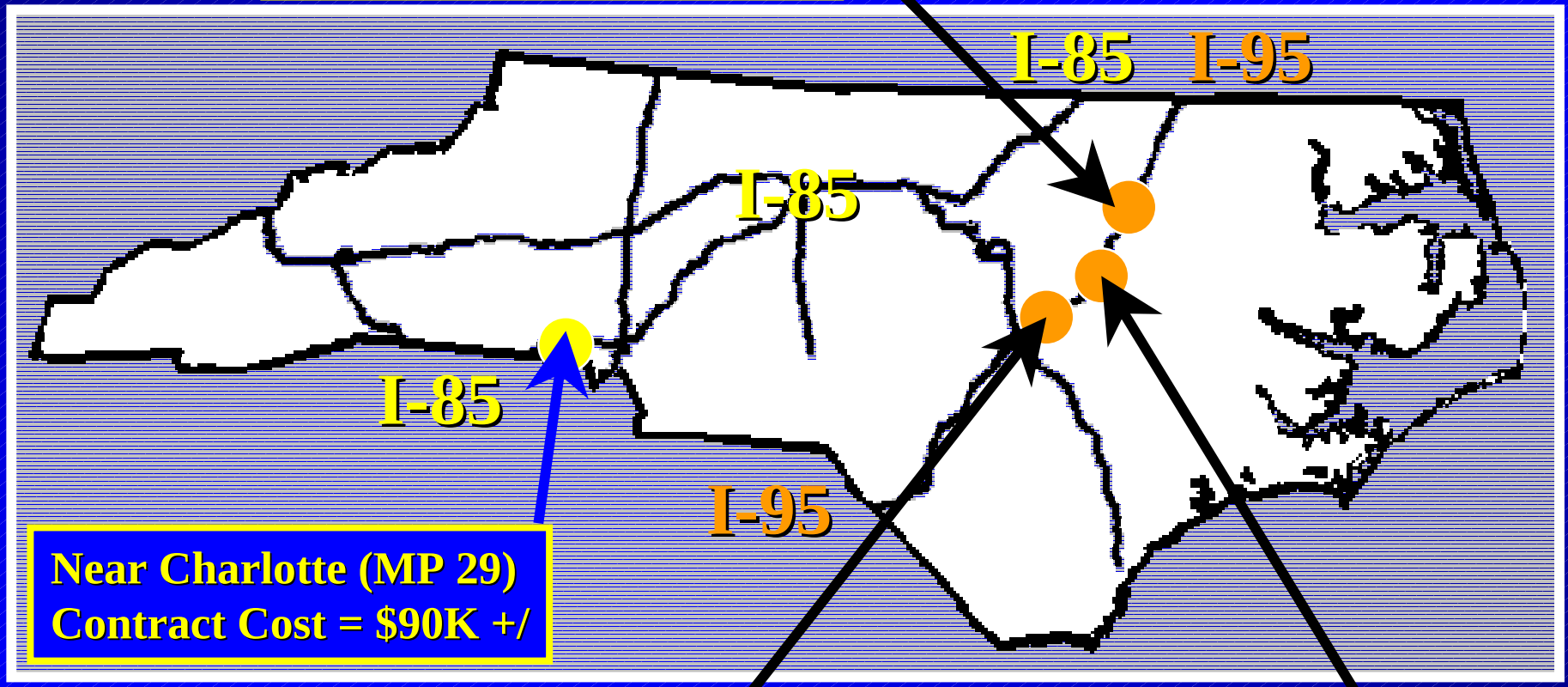
SMARTZONE EVOLUTION...
What have we done and where do we go from here?

- Have completed 1 project deployment on I-95 near Fayetteville
- Have 2 other contracts let on I-95 in Div. 4 that should be deployed within the next 30 days…with moving alternate route locations!
- Currently working on another contract for deployment on I-95 in Johnston County near Four Oaks
- Will soon be using this technology to help hydroplaning and speeding issues on I-85 outside of Charlotte

Future SMARTZONE Deployments

Near Rocky Mt. (MP 145)

Contract Cost = $264,500



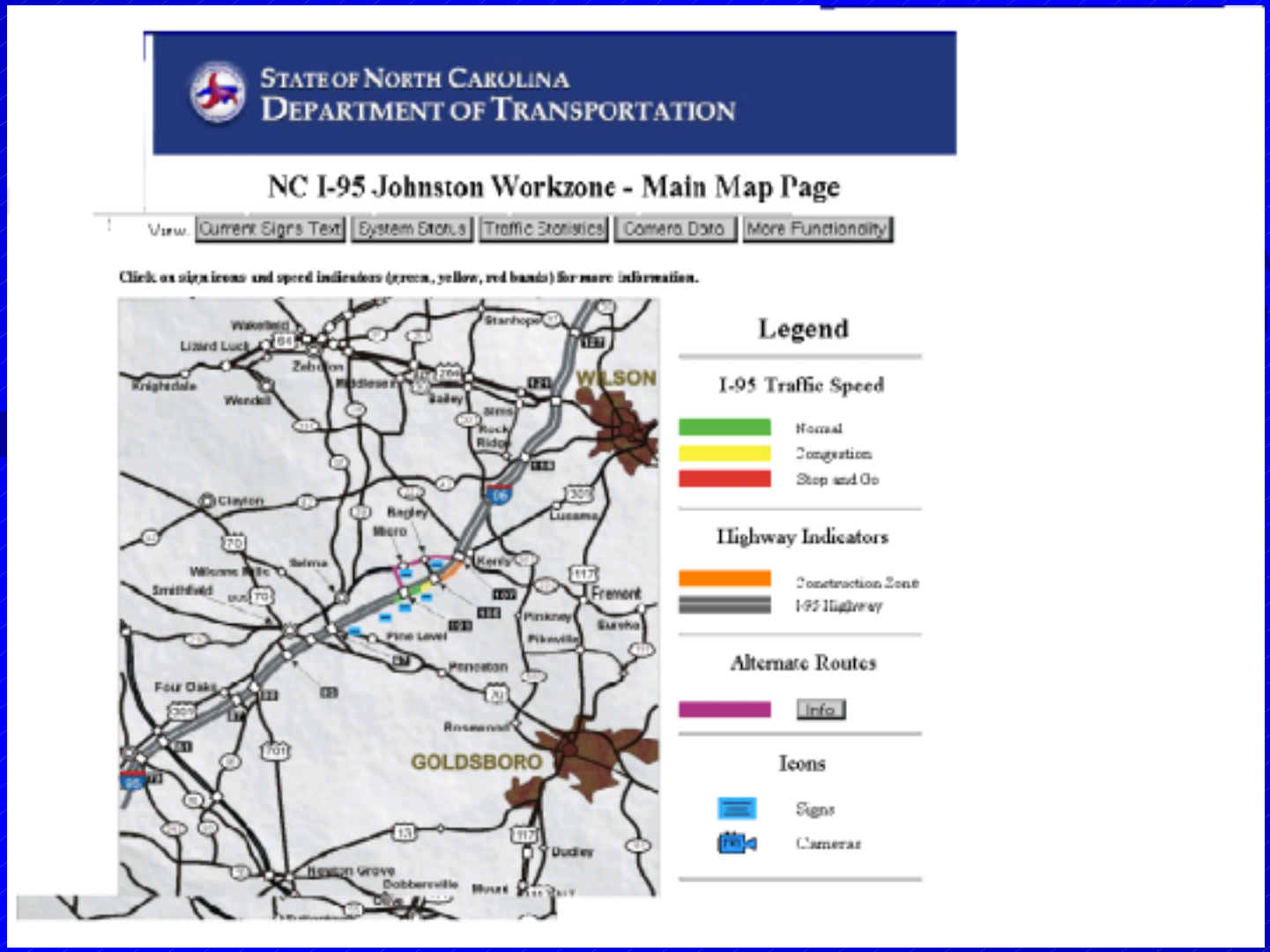
Near Charlotte (MP 29)
Contract Cost = $90K +/

Near Smithfield (MP 87)

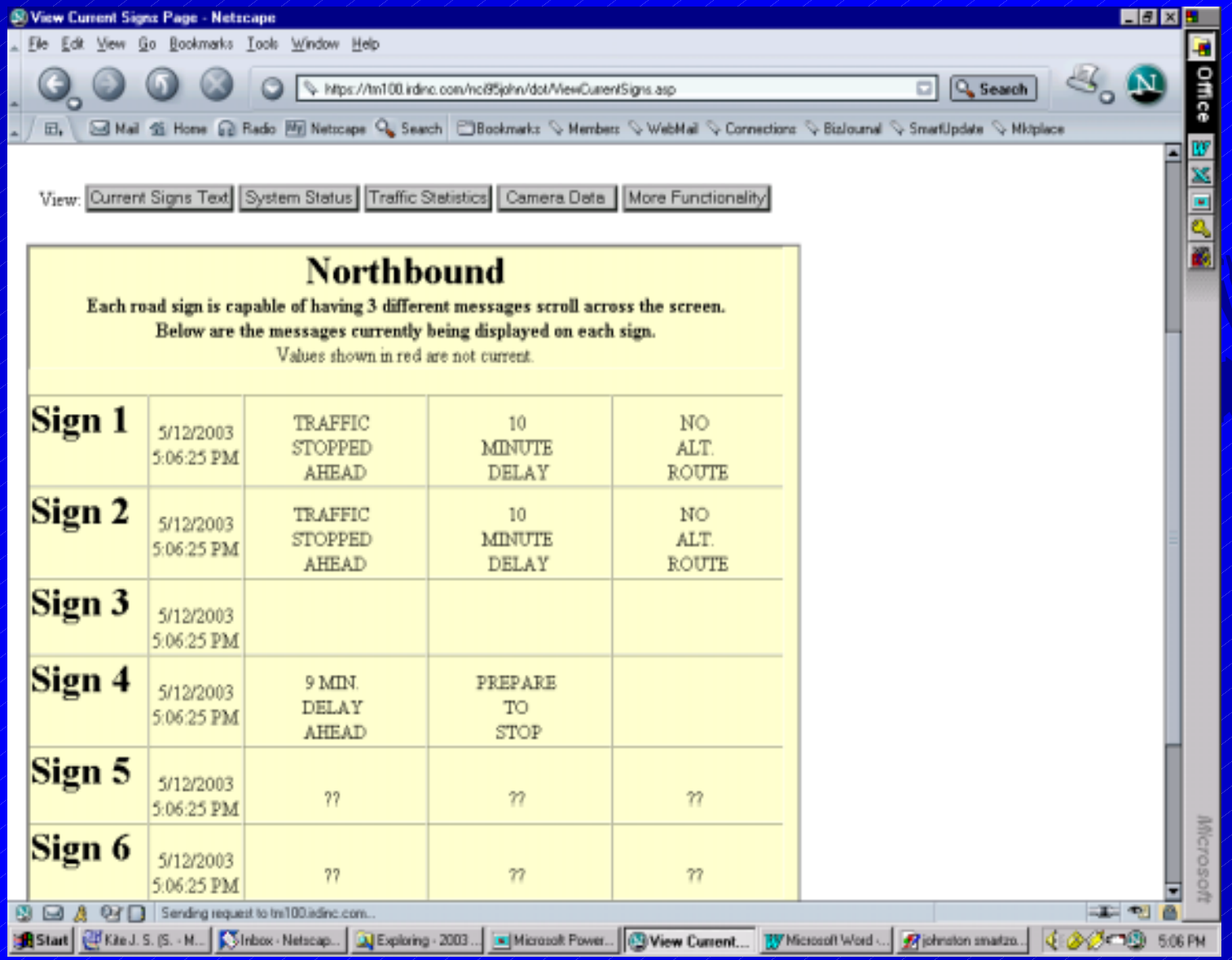
Contract Cost = N/A

Near Kenly (MP 107)
Contract Cost = $178,850

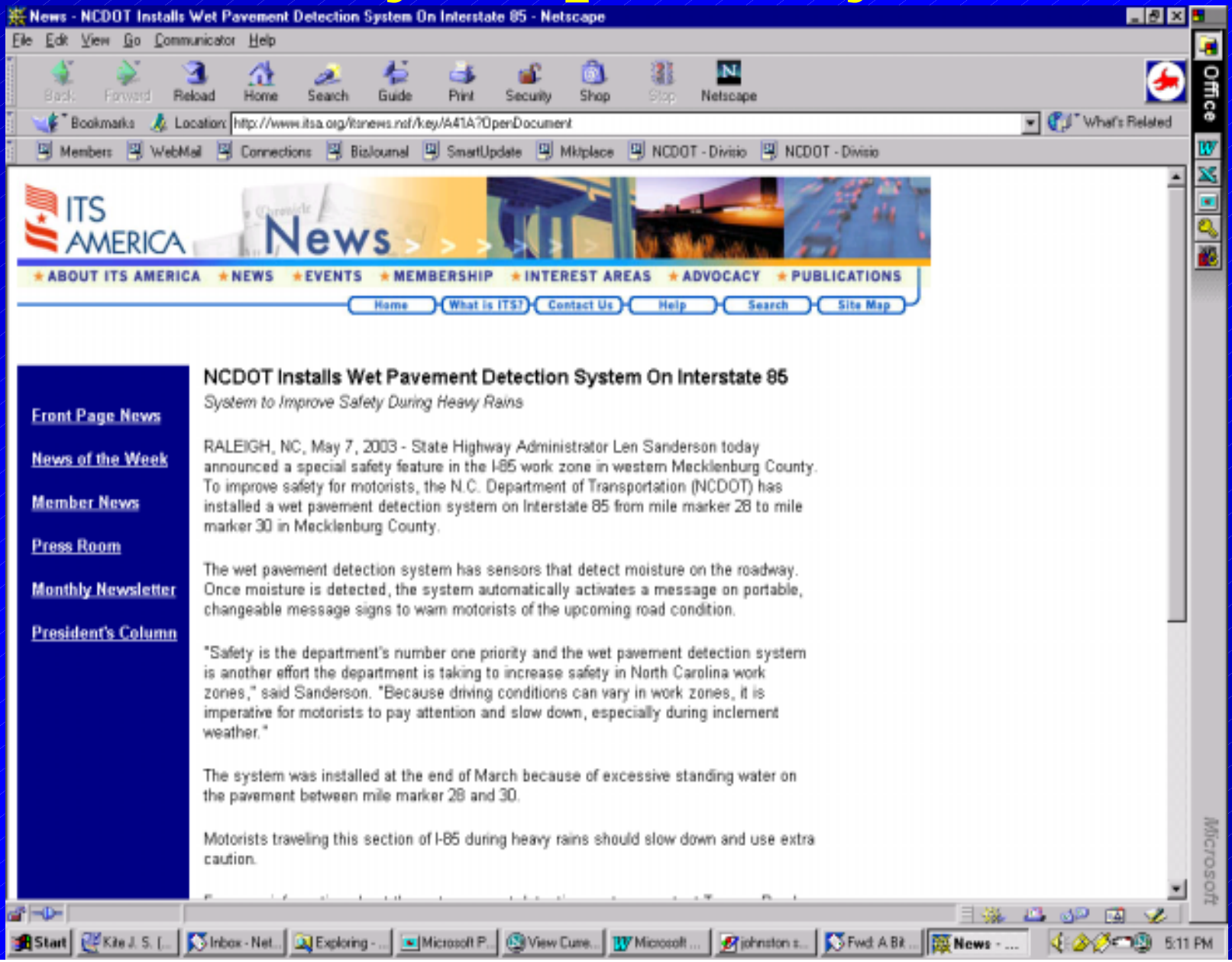
I-95 Johnston Cty. SMARTZONE



I-95 Johnston Cty SMARTZONE

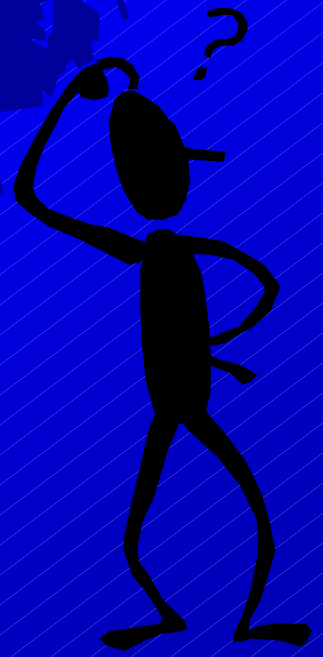


I-85 Hydroplane System



SMARTZONES- The technology for workzone management

Questions/Comments?



How does it work?

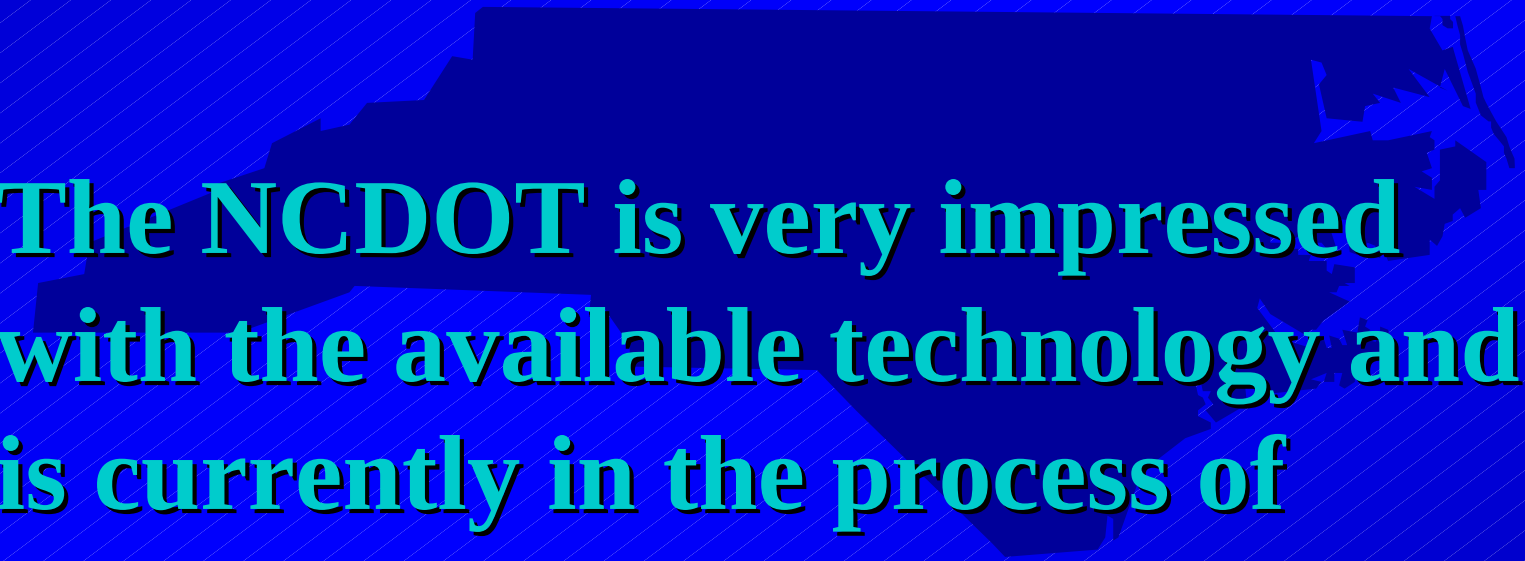
SMARTZONES incorporate roadside speed and volume sensors to detect slow-downs.

This information is then transmitted to an on-site computer via radio, cellular or satellite communication for processing.

Delay information is then transmitted from the computer to portable Changeable Message Signs

Success?

You bet!



The NCDOT is very impressed with the available technology and is currently in the process of installing 2 more ‘SMARTZONES’ on I-95

Traffic !@$%

I-95 SMARTZONE Deployment

Workzone is located at Milepost 58

Surveillance Area: I-95 between Milepost 46 and Milepost 73 in Cumberland and Harnett Counties

Preselected Alternate Route: US 301.

Northbound Exit 55

Southbound Exits 61 and 65